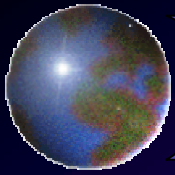# *Using trade-related policies to control species introductions: if and when*

Christopher Costello - Bren School of Environmental Science & Management UC Santa Barbara
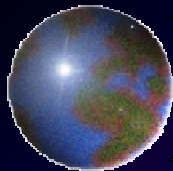
USDA-ERS: May 13, 2003

Introduction vectors
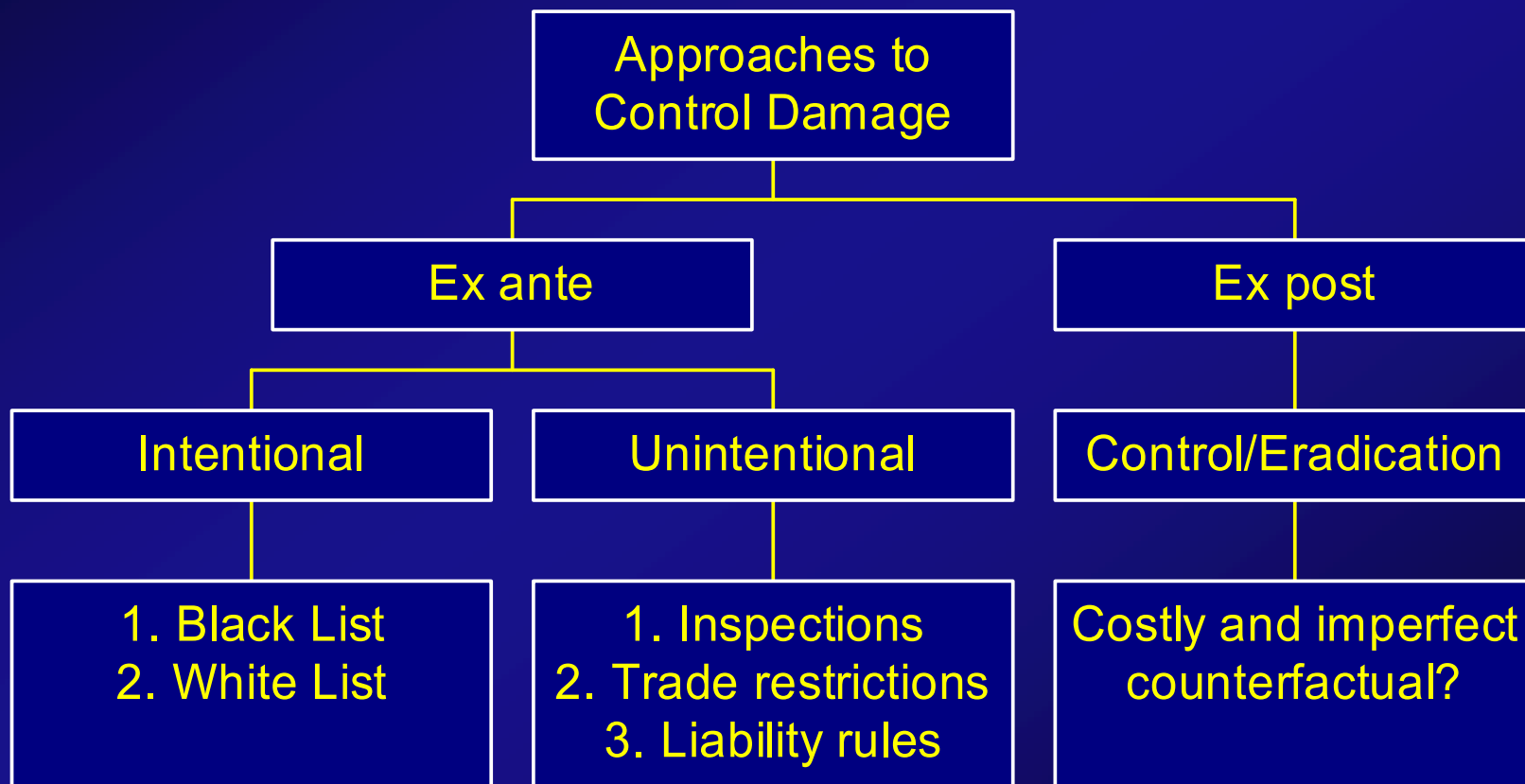
- Intentional (legal) introductions
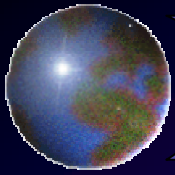 - ornamentals, pets, etc.
  - economic benefits, uncertain damage
- Unintentional introductions
  - bundled with traded goods
 - by-product of trade, hitchhike on traded goods or in packing materials/containers.
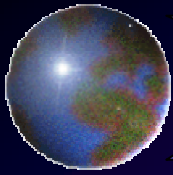
Ex-ante vs. ex-post control

Ex-ante controls: Intentional

- Black list policy: admit all species not contained on a "black list"
  - High type II error (accept too many)
  - Excessive damage from 'dirty' species.
- White list policy: admit only species contained on "white list"
  - High type I error (reject too many)
  - Economic loss from reduced imports of valuable, 'clean' species
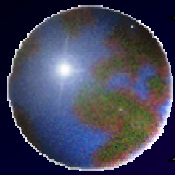
Ex-ante controls: Unintentional

- <u>Improve inspections</u>: port inspections at home or foreign site
  - Costly, still uncertain, what to look for?
- <u>Trade bans/tariffs</u>: reduce volume of imports, host-specific tariffs?
  - Large economic consequences, WTO non-discrimination
  - Unintended consequences: feedbacks affect damage
- <u>Liability rules</u>: partner guarantees cleanliness.
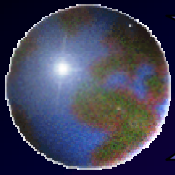 - Difficult to prove, bankruptcy, lag between introduction and discovery/damage

Ex-post controls

- **Population control**
  - Can be extremely costly
 - Costs are ongoing
  - To what level?
- **Eradication**
  - May only be viable at low population levels
 - May be worth large investment
  - High uncertainty (counterfactual)

Pursue ex-ante or ex-post policy?

- Damage rate appears to be increasing.
- Whether to pursue ex-ante or ex-post policies depends on whether:
  - Introduction rate is increasing and/or
  - Species already here are causing more damage.
- Is introduction rate increasing?
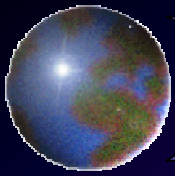 - Cohen & Carlton (1998) show increasing rate of discoveries…
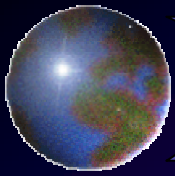
Discovery of exotic species
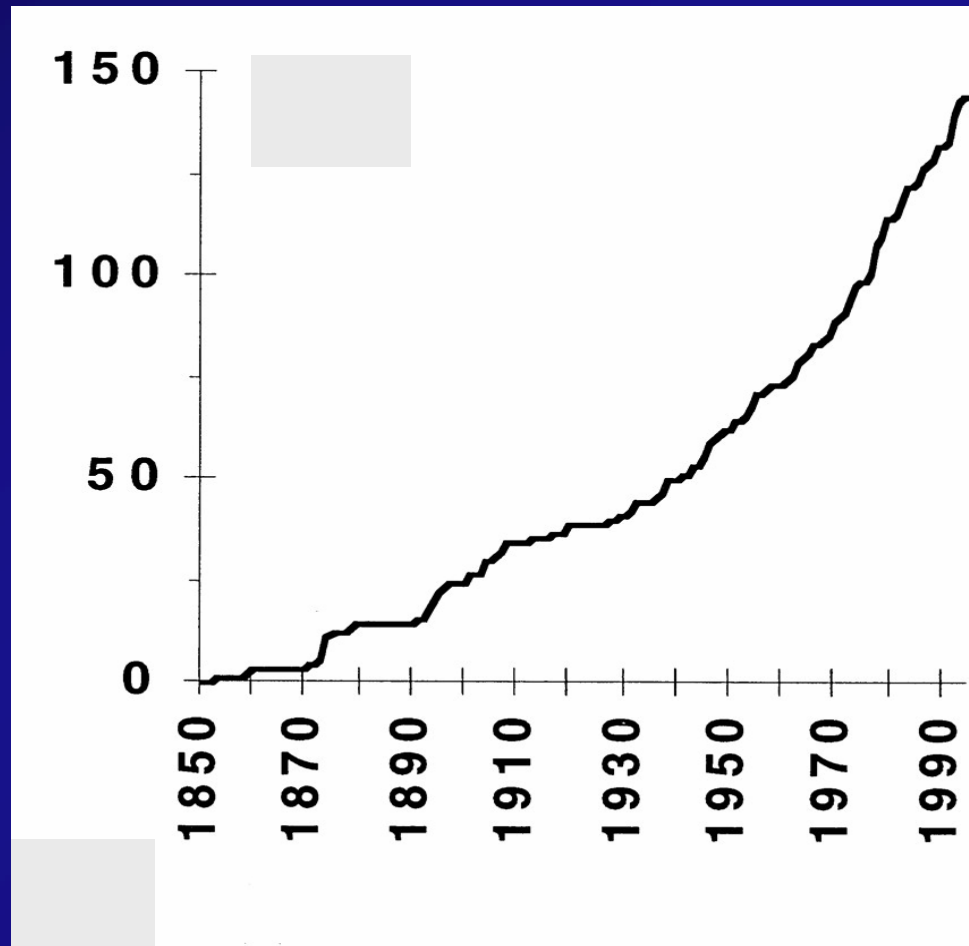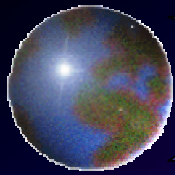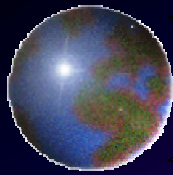
Discoveries vs. introductions

- Costello & Solow (2003) show that discovery curve will be convex even when introduction rate is constant or even zero.

- So cannot use increasing rate of discoveries as evidence that true rate of introductions is increasing.

Simulation model

Model:
Constant introduction rate

Data

150
100
50
0

1850 1870 1890 1910 1930 1950 1970 1990
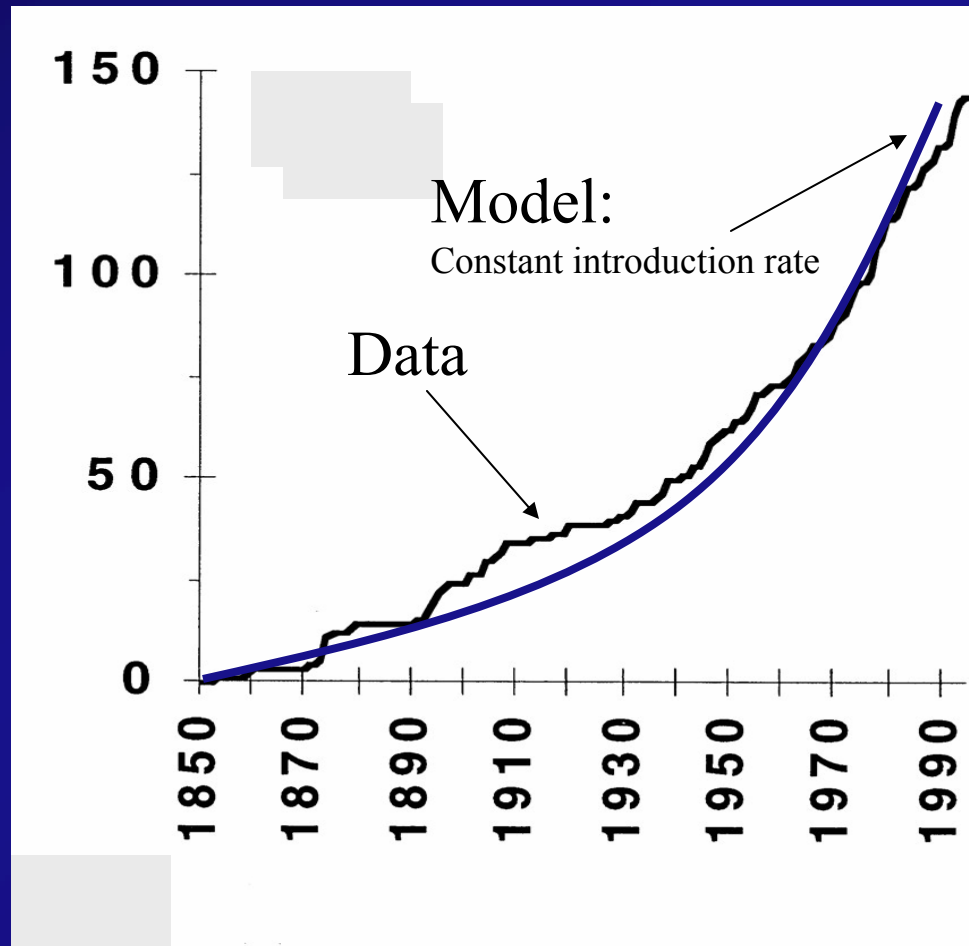
Research implications

- Range/population expansion in harmful species that are already present?
  - Large body of evidence that this effect is growing
  - Suggests emphasis on **ex-post controls** (e.g. eradication)
  - Requires careful empirical studies…will guide focus of ex-ante vs. ex-post measures.
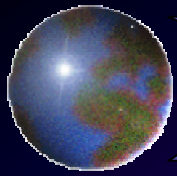
Some future research directions

1. Value of information & adaptive management for intentional introductions (Black list vs. White list)
2. Tariffs vs. inspections
3. Empirical estimates of introduction rates and appropriate policy response
4. Effect of globalization on trade patterns, partners, and ecological consequences
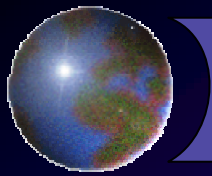
Value of information & adaptive management

- Control of intentional introductions is driven by <u>uncertainty</u>
- Acquire information by admitting species, lab tests, limited introductions, observing outcomes in similar places
- What is value of this information?
- How does this inform the White List vs. Black List debate?
- How does policy choice depend on economics, biology, uncertainty, etc?
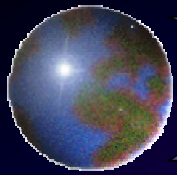
Tariffs vs. inspections

- For unintentional introductions what are tradeoffs between these 2 instruments?
- When should we use both?
- Will WTO allow discrimination based on "potential" damage?
- Can we derive general policies based on theory and empirical examples?
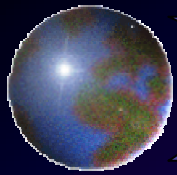
Empirical estimates of the introduction rate

- Ultimately whether emphasize ex-ante or ex-post controls depends on introduction rate.
- No good estimates exist (convex discovery diff. than convex introductions).
- The SARS parallel (travel advisory is ex-ante, quarantine is ex-post).
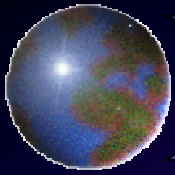
Globalization & trade patterns

- Globalization is causing (& will continue to cause) change in trade patterns
- Not just about volume, it's about trade partners - trade between countries that haven't traded in past.
- Important ecological/pecuniary consequences.
- Intra-industry trade increasing.
- What have been/will be the effects of globalization on rate of successful (damaging) introductions.